CLAIMS:

1. A fiber laser using as a gain medium an optical fiber that has a core or a cladding doped with a rare-earth element having a laser transition level, said fiber laser being characterized in that:

said optical fiber is doped with at least thulium; and said fiber laser employs 1.2 μm band light or a pumping source for exciting the thulium from the lowest energy level $^3H_6$ to $^3H_5$ excitation level as a pumping source, and operates at least at 2.3 μm band.

2. The fiber laser as claimed in claim 1, wherein said optical fiber doped with the thulium is a non-silica based fiber that uses glass having a nonradiative relaxation rate which is caused by multi-phonon relaxation and is less than a nonradiative relaxation rate of silica glass as host glass of the optical fiber.

3. The fiber laser as claimed in claim 2, where said non-silica based fiber is one of a fluoride fiber, tellurite glass fiber, bismuth based glass fiber, fluorophosphate glass fiber, chalcogenide glass fiber, and germanate hydroxide glass fiber.

4. The fiber laser as claimed in any one of claims 1-3, using laser transition at least from $^3F_4$ to $^3H_5$ level.

5. The fiber laser as claimed in any one of claims 1-3, operating in both 2.3 μm band and 1.8 μm band wavelength regions.

6. The fiber laser as claimed in any one of claims 1-3, using laser transition not only from $^3F_4$ to $^3H_5$ level, but also from $^3H_4$ to $^3H_5$ level.

7. A fiber laser using as a gain medium an optical fiber that has a core or a cladding doped with a rare-earth element having a laser transition level, said fiber laser having said optical fiber doped at least with thulium, and operating at 2.3 μm band, said fiber laser being characterized in that:

said fiber laser uses 0.67 μm band or 0.8 μm band light as a pumping source, and said optical fiber doped at least with the thulium is a non-silica based fiber which uses, as host glass of said optical fiber, glass having a nonradiative relaxation rate which is caused by multi-phonon relaxation and is lower than a nonradiative relaxation rate of silica glass.

8. The fiber laser as claimed in claim 7, wherein

said optical fiber doped at least with the thulium is one of a tellurite glass fiber, bismuth based glass fiber, fluorophosphate glass fiber, chalcogenide glass fiber, and

germanate hydroxide glass fiber.

9. The fiber laser as claimed in claim 7 or 8, using laser transition from $^3F_4$ to $^3H_5$ level.

10. A spontaneous emission source using as a gain medium an optical fiber that has a core or a cladding doped with a rare-earth element having a laser transition level, said spontaneous emission source being characterized in that:

said optical fiber is doped with at least thulium; and said spontaneous emission source employs 1.2μm band light or a pumping source for exciting the thulium from the lowest energy level $^3H_6$ to $^3H_5$ excitation level as a pumping source, and operates at least at 2.3 μm band.

11. The spontaneous emission source as claimed in claim 10, wherein said optical fiber doped with the thulium is a non-silica based fiber which uses, as host glass of said optical fiber, glass having a nonradiative relaxation rate which is caused by multi-phonon relaxation and is lower than a nonradiative relaxation rate of silica glass.

12. The spontaneous emission source as claimed in claim 11, wherein said non-silica based fiber is one of a fluoride fiber, tellurite glass fiber, bismuth based glass fiber, fluorophosphate glass fiber, chalcogenide glass fiber, and germanate hydroxide glass fiber.

13. The spontaneous emission source as claimed in any one of claims 10-12, using laser transition at least from $^3F_4$ to $^3H_5$ level.

14. The spontaneous emission source as claimed in any one of claims 10-12, operating in both 2.3 μm band and 1.8 μm band wavelength regions.

15. The spontaneous emission source as claimed in any one of claims 10-12, using laser transition not only from $^3F_4$ to $^3H_5$ level, but also from $^3H_4$ to $^3H_5$ level.

16. A spontaneous emission source using as a gain medium an optical fiber that has a core or a cladding doped with a rare-earth element having a laser transition level, said spontaneous emission source having said optical fiber doped at least with thulium, and operating at 2.3 μm band, said spontaneous emission source being characterized in that:

said spontaneous emission source uses 0.67 μm band or 0.8 μm band light as a pumping source, and said optical fiber doped at least with the thulium is a non-silica based fiber which uses, as host glass of said optical fiber, glass having a nonradiative relaxation rate which is caused by multi-phonon relaxation and is lower than a nonradiative relaxation rate of silica glass.

17. The spontaneous emission source as claimed in claim 16, wherein said optical fiber doped at least with the thulium is one of a tellurite glass fiber, bismuth based glass fiber, fluorophosphate glass fiber, chalcogenide glass fiber, and germanate hydroxide glass fiber.

18. The spontaneous emission source as claimed in claim 17, using laser transition from $^3F_4$ to $^3H_5$ level.

19. An optical fiber amplifier using as a gain medium an optical fiber that has a core or a cladding doped with a rare-earth element having a laser transition level, said optical fiber amplifier being characterized in that:

said optical fiber is doped with at least thulium; and said optical fiber amplifier employs 1.2 μm band light or a pumping source for exciting the thulium from the lowest energy level $^3H_6$ to $^3H_5$ excitation level as a pumping source, and operates at least at 2.3 μm band.

20. The optical fiber amplifier as claimed in claim 19, wherein said optical fiber doped with the thulium is a non-silica based fiber that uses glass having a nonradiative relaxation rate which is caused by multi-phonon relaxation and is less than a nonradiative relaxation rate of silica glass as host glass of the optical fiber.

21. The optical fiber amplifier as claimed in claim 20,

where said non-silica based fiber is one of a fluoride fiber, tellurite glass fiber, bismuth based glass fiber, fluorophosphate glass fiber, chalcogenide glass fiber, and germanate hydroxide glass fiber.

22. The optical fiber amplifier as claimed in any one of claims 19-21, using laser transition at least from $^3F_4$ to $^3H_5$ level.

23. The optical fiber amplifier as claimed in any one of claims 19-21, operating in both 2.3 μm band and 1.8 μm band wavelength regions.

24. The optical fiber amplifier as claimed in any one of claims 19-21, using laser transition not only from $^3F_4$ to $^3H_5$ level, but also from $^3H_4$ to $^3H_5$ level.

25. An optical fiber amplifier using as a gain medium an optical fiber that has a core or a cladding doped with a rare-earth element having a laser transition level, said optical fiber amplifier having said optical fiber doped at least with thulium, and operating at 2.3 μm band, said optical fiber amplifier being characterized in that:

said optical fiber amplifier uses 0.67 μm band or 0.8 μm band light as a pumping source, and said optical fiber doped at least with the thulium is a non-silica based fiber which uses, as host glass of said optical fiber, glass having

a nonradiative relaxation rate which is caused by multi-phonon relaxation and is lower than a nonradiative relaxation rate of silica glass.

26. The optical fiber amplifier as claimed in claim 25, wherein said optical fiber doped at least with the thulium is one of a tellurite glass fiber, bismuth based glass fiber, fluorophosphate glass fiber, chalcogenide glass fiber, and germanate hydroxide glass fiber.

27. The optical fiber amplifier as claimed in claim 25 or 26, using laser transition from $^3F_4$ to $^3H_5$ level.